



28 July 1994

Mr. Richard Spiese
State of Vermont DEC
HMMD - SMS
103 S. Main St.
Waterbury, VT 05671-0404

Re: Initial Site Investigation Report, Killington Ski Area, Killington, VT
(VT DEC Site #93-1532)

Dear Mr. Spiese,

Please find enclosed a copy of the above-referenced document. The report summarizes the results of a site assessment performed at the site.

Please call me at (802) 860-6065 if you have any questions or comments on this work.

Sincerely,

A handwritten signature in cursive script, appearing to read "Ron Miller".

Ron Miller
Hydrogeologist II and Regional Manager

Enclosure: Report
cc: Mr. John Cole, Killington Ski Area

RWM:rwm DECREPCO.SAM

HAZARDOUS WASTE
INVESTIGATION
DIVISION

JUL 32 10 19 AM '94

JUL 32 10 19 AM '94

HAZARDOUS MATERIALS
LABORATORY DIVISION

INITIAL SITE INVESTIGATION REPORT

**Killington Ski Area
Killington, VT**

VT DEC Site #93-1532

22 July 1994

Prepared for:

Mr. John Cole
Killington, Ltd.
Killington, Vermont

Prepared by:

Ground Water of Vermont
1 Mill Street, Box C-5
Burlington, Vermont
(802) 860-6065

GWV Project #V94-027



21 July 1994

Mr. John Cole
Killington, Ltd.
Killington, VT 05751

Re: Initial Site Investigation Report
Killington Ski Area, Killington, VT (VT DEC Site #93-1532)

Dear Mr. Cole,

Please find enclosed a copy of the above-referenced document for your review and approval. The report summarizes the findings of an initial site investigation conducted at the Killington Ski Area. Upon receiving your approval, I will forward a copy of the report to the State of Vermont.

I appreciate having the opportunity to perform this work for you. Please call me at (802) 860-6065 if you have any questions or comments.

Sincerely,

A handwritten signature in cursive script, appearing to read "Ron Miller".

Ron Miller
Hydrogeologist II and Regional Manager

Enclosure: Report
RWM:rwm 94027L01.SAM

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EXECUTIVE SUMMARY

An initial site investigation conducted by Ground Water of Vermont (GWV) at the Killington Ski Area in Killington, Vermont has evaluated the degree of soil and ground water contamination in the vicinity of a 1,000-gallon No. 2 fuel oil underground storage tank (UST) on the property. The source of the petroleum release was reported as an incorrectly installed piping line, which has since been repaired. In November 1993, the UST was temporarily removed from the ground, and the bulk of petroleum-contaminated soils were excavated and stockpiled at an off-site location (Harvey's gravel pit in Stockbridge, Vermont). Although soil contamination was detected above Vermont guideline standards in a soil boring/monitoring well installed near the UST, ground water in the vicinity of the UST does not appear to have been impacted above Vermont ground water enforcement or drinking water standards. GWV has concluded that no further on-site monitoring or remedial efforts are warranted. The stockpiled soils at Harvey's gravel pit should be monitored semi-annually with a photoionization detector (PID). When residual contamination has decreased to background levels, the site should be considered for Site Management Activity Completed (SMAC) designation by the Vermont Department of Environmental Conservation.

The subsurface investigation consisted of the installation, sampling, and analysis of one soil boring/monitoring well in the vicinity of the UST. Soil samples were collected from the borings and screened with a photoionization detector (PID). Water samples collected from the monitoring wells were analyzed for volatile organic compounds (VOCs) by EPA Method 8020, and for Total Petroleum Hydrocarbons (TPH) by EPA Method 418.1.

Soils encountered during subsurface explorations consisted of fine to coarse sand fill above till. Bedrock was not encountered. Ground water was encountered at 4 feet below the surface. Petroleum compounds were detected in low levels in the soils and ground water near the former UST pit. Soils collected from the soil boring had PID readings of up to 34 parts per million (ppm), which is above the Vermont guideline soil standard of 10 ppm. TPH was not detected in the ground water sample collected from the monitoring well. VOC levels in the monitoring well ground water sample were below analytical detection limits for all compounds except toluene. Toluene was detected at 7 parts per billion (ppb), which is below the Vermont drinking water standard of 1,000 ppb and the Vermont ground water enforcement standard of 2,420 ppb.

Because the source of the release has been repaired, and the bulk of petroleum contamination has been removed from the ground, the remaining in-situ soil and ground water contamination will likely decrease over time through the processes of degradation, dilution, dispersion, and adsorption.

1.0 INTRODUCTION

This report details the results of a limited site investigation at the Killington Ltd. property in Killington, Vermont. The report has been prepared by Ground Water of Vermont (GWV) for Killington, Ltd.

The site investigation has been conducted to fulfill requests made by Mr. Chuck Schwer of the Vermont Department of Environmental Conservation (VT DEC) Sites Management Section (SMS) in a 15 February 1994 letter to Mr. John Cole of Killington, Ltd. The VT DEC requested that additional work be conducted at the site after receiving a report that indicated that a 1,000 gallon No.2 fuel oil UST system at the site had failed. The VT DEC requested the following:

1. One soil boring in the area of the UST excavation to the depth of the shallow ground water table. The soils from this boring will be screened using a Photoionization Device (PID).
2. Install one monitoring well in the boring to be sampled for fuel oil constituents.
3. Develop a plan to treat and/or monitor the stockpiled soils;
4. Determine the need for a long-term treatment or monitoring plan for the site;
5. Submit to the SMS a summary report outlining the work performed and providing conclusions and recommendations.

On 22 April 1994, Killington Ltd. retained the services of Ground Water of Vermont to perform this work. GWV submitted a preliminary work plan and cost estimate to the VT DEC on 22 April 1994. The VT DEC approved the work plan and cost estimate on 29 April 1994.

1.1 Scope of Work

To accomplish the investigation objectives, GWV has performed the following:

- Reviewed existing data on the site;
- Supervised the installation of one soil boring / monitoring well on the property;
- Collected and submitted for laboratory analysis a ground water sample from the monitoring well;
- Identified potential receptors of the contamination;
- Evaluated the need for treatment and/or a long-term monitoring plan for the site; and
- Prepared a summary report that details the work performed and provides conclusions and recommendations.

1.2 Site Location

The site is located in the Town of Sherburne, Vermont, along the east side of the Killington Access Road (see Figure 1, Site Location Map). The site consists of the Snowshed Base Lodge, an unpaved parking lot, and the Snowshed Pond. (see Figure 2, Site Plan).

2.0 SITE HISTORY

The site is currently operated by Killington, Ltd. of Killington, Vermont. One 1,000 gallon underground storage tank (UST), used for the storage of No.2 fuel oil, is located between the Snowshed Base Lodge and the Snowshed Pond, just northeast of the north corner of the Snowshed Base Lodge. The land in the vicinity of the fuel oil tank slopes steeply downward from the Lodge to the Pond. The UST was installed in 1993.

In early November 1993, Killington maintenance personnel noticed a sheen on the Snowshed Pond, and determined that a return line connected to the UST had been incorrectly installed, discharging an undetermined volume of No. 2 fuel oil to the subsurface. Pollution Solutions of Vermont was contracted to temporarily remove the UST and excavate the petroleum contaminated soils. On 10 November 1993, the UST was removed from the ground, and approximately eighty cubic yards of petroleum-contaminated soils were removed from the excavation and stockpiled at Harvey's gravel pit in Stockbridge, Vermont. Except for a small volume (estimated at less than 5 cubic yards) that could not be removed without damaging a building footing, all soils with PID readings above 10 parts per million (ppm) were removed from the site. The UST was then re-installed in the same location with a properly installed return line.

3.0 INVESTIGATIVE PROCEDURES AND RESULTS

3.1 Soil Boring/Monitoring Well Installation

On 20 May 1994, GWV supervised the installation of a soil boring/monitoring well in the vicinity of the fuel oil underground storage tank. The approximate boring location is shown on Figure 2 in Appendix A. The soil boring/monitoring well was installed by Adams Engineering of Underhill, Vermont, using a vibratory drill rig with a 2.4" inner diameter casing. The soil boring/monitoring well was installed to evaluate the degree of soil and ground water contamination, and therefore was located close to the former tank location (see Figure 2 in Appendix A). The soil boring could not be located between the UST and the pond due to a steep slope leading down to the pond.

The soil boring (MW-1) encountered approximately 3.5 feet of fill materials, underlain by fine sand and till. Soil characteristics are listed on the well log in Appendix B. Ground water was encountered at a depth of approximately four feet below ground surface. A monitoring well was installed in the soil boring. Monitoring well construction details are included in the well log in Appendix B.

3.2 Soil Screening Results

The screening results of soil samples collected from the borings indicate that soils in the former UST pit remain contaminated with petroleum compounds. Soil samples were collected continuously from the soil boring, using a five-foot vibratory core sampler. The samples were screened in the field for volatile organic compounds (VOCs) with a Photovac TIP II portable photoionization detector (PID), which had been calibrated with isobutylene gas to a benzene reference. PID readings in MW-1 ranged from 0.1 to 34 parts per million (ppm) and averaged 12.9 ppm. The highest reading of 34 ppm was located approximately 3 feet below ground surface. Results of the PID screening are presented in the well log in Appendix B.

3.3 Ground Water Sampling and Analysis

Ground water sampling was conducted on 24 May 1994, and followed GWV's Ground Water Sampling Protocol. The water sample was submitted to an analytical laboratory, where it was tested for the volatile petroleum compounds benzene, toluene, ethylbenzene, and xylenes (collectively termed BTEX) and the gasoline additive methyl-tert butyl-ether (MTBE) by EPA Method 8020, and for Total Petroleum Hydrocarbons (TPH) by EPA Method 418.1.

Analytical results showed all compounds below quantifiable limits except for toluene. Toluene was detected at 7 parts per billion (ppb) in MW-1, which is below the Vermont drinking water standard of 1,000 ppb, and below the Vermont ground water enforcement standard of 2,420 ppb. Laboratory report forms are included in Appendix C.

4.0 STOCKPILED SOIL TREATMENT / DISPOSAL PLAN

Approximately eighty cubic yards of petroleum-contaminated soil that were excavated during the UST removal are currently stockpiled at Harvey's gravel pit in Stockbridge, Vermont. The most cost-effective treatment option for the stockpiled soils is passive treatment on-site using the existing polyencapsulation. The stockpiled soils should be monitored semi-annually with a photoionization detector to verify that contaminant levels are decreasing. After PID readings have declined to background levels, permission can be sought from the VT DEC to spread the soils on the ground at the gravel pit site.

Other options considered for stockpiled soil treatment and disposal were asphalt batching and landfarming. Asphalt batching is estimated to cost \$7,500. The total cost for landfarming is estimated to be \$5,000, providing a suitable location can be found for landfarming and no additional soil borings or monitoring wells will be necessary. Semi-annual monitoring of the stockpiled soils for three years is expected to cost \$1800.

5.0 CONCLUSIONS

On the basis of the above-described investigation, Ground Water of Vermont has concluded the following:

1. There has been a release or releases of petroleum to the subsurface at the site, which appears to have been caused by a piping failure in a 1,000-gallon No. 2 fuel oil underground storage tank (UST) system.
2. The apparent source of contamination was repaired and the majority of petroleum-contaminated soils were excavated and stockpiled at Harvey's gravel pit in Stockbridge, Vermont.
3. Soils in the immediate vicinity of the UST location have been impacted by the release(s). PID readings on soil samples collected from a soil boring near the former UST pit indicate the presence of petroleum hydrocarbons at up to 34 parts per million (ppm).
4. Ground water in the surficial aquifer in the immediate vicinity of the former UST location did not contain quantifiable levels of Total Petroleum Hydrocarbons or volatile organic compounds (VOCs) with the exception of toluene detected at 7 parts per billion (ppb). The toluene concentration was below the Vermont drinking water standard of 1,000 ppb, and below the Vermont ground water enforcement standard of 2,420 ppb.
5. The natural processes of dilution, dispersion, and degradation will likely reduce the residual soil and ground water contamination at the site to below detectable levels.

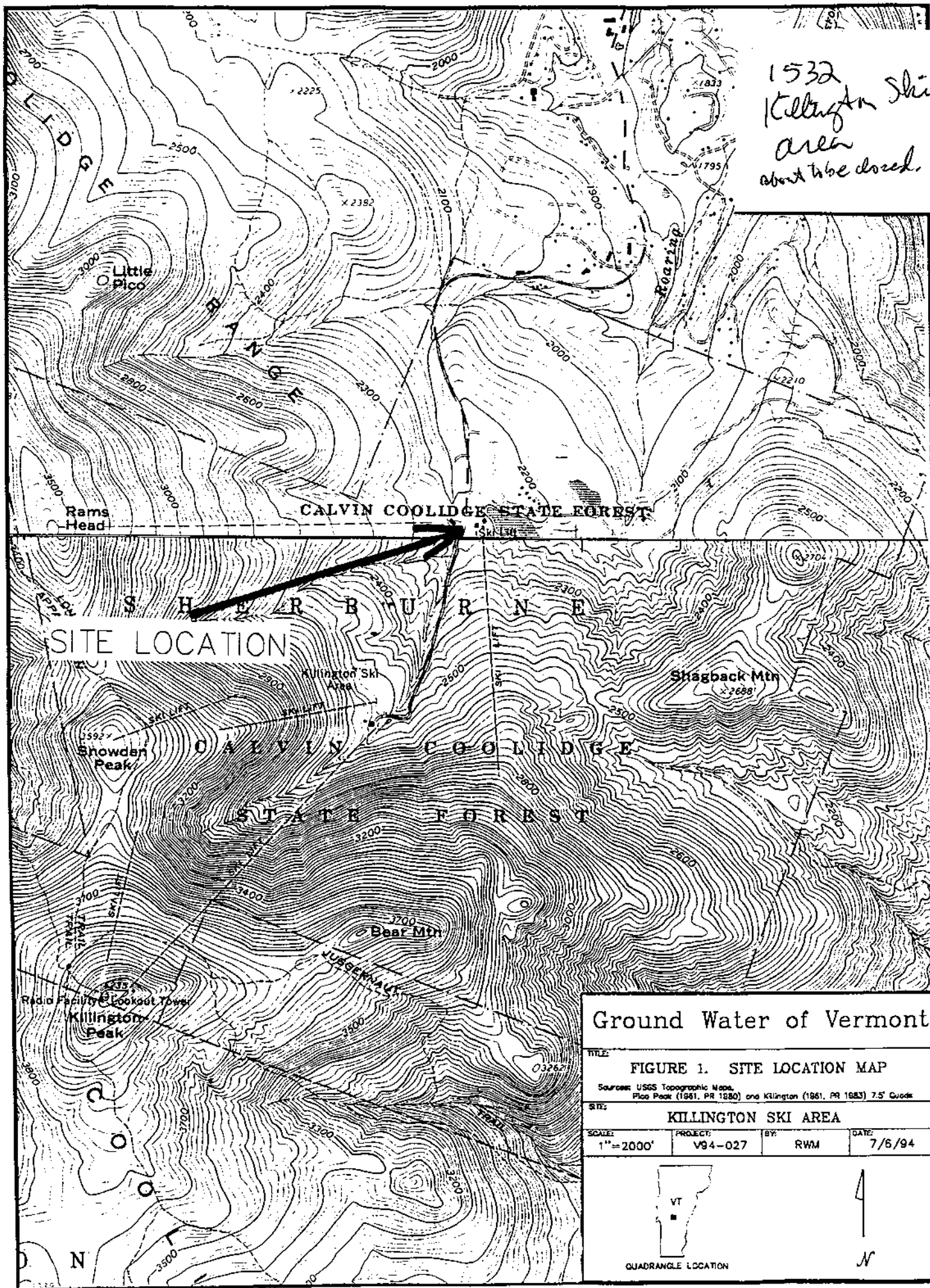
6.0 RECOMMENDATIONS

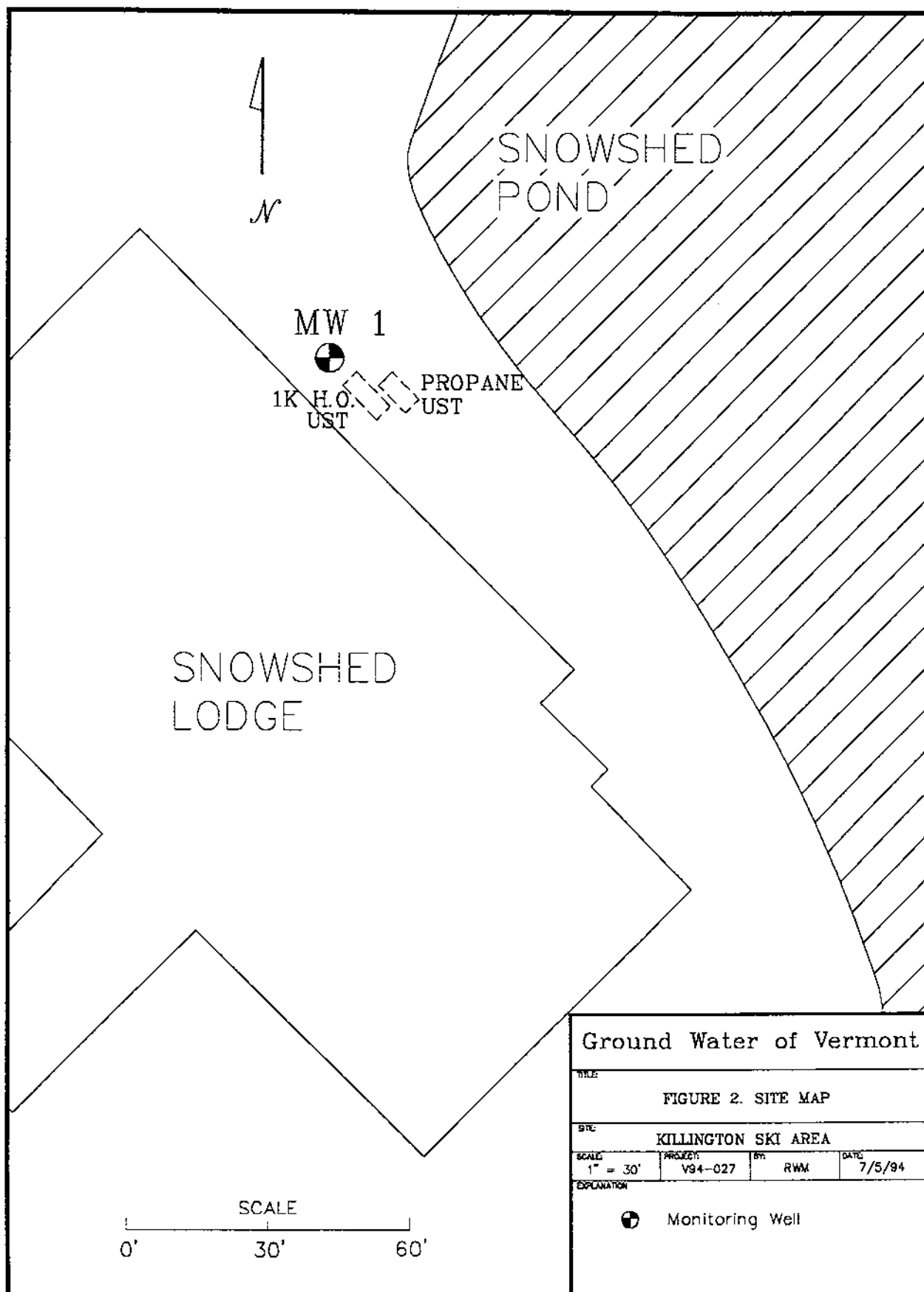
On the basis of the findings reached during this investigation, Ground Water of Vermont makes the following recommendations:

1. Additional monitoring of the ground water monitoring well does not appear to be warranted.
2. The stockpiled soils should be monitored with a photoionization detector (PID) semi-annually, until PID readings have declined to background levels. Permission to spread the soils on-site may then be sought from the VT DEC.
3. After the stockpiled soil contamination has declined to background levels, the site should be considered for Site Management Activity Completed (SMAC) designation.

APPENDIX A

Figures



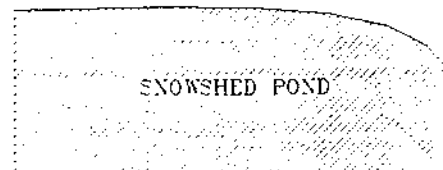


APPENDIX B

Boring Log

PROJECT Killington Ski AreaLOCATION Killington, VTDATE DRILLED 5 20 94 TOTAL DEPTH OF HOLE 10'DIAMETER 2.375"SCREEN DIA. 1.5" LENGTH 7' SLOT SIZE 0.010"CASING DIA. 1.5" LENGTH 3' TYPE PVCDRILLING CO. Adams Egr. DRILLING METHOD Drive CasingDRILLER Jerry Adams LOG BY Ron MillerWELL NUMBER MW-1

SNOWSHED LODGE

UST MW1

GROUND WATER OF VERMONT

DEPTH IN FEET	WELL CONSTRUCTION	NOTES	PID READINGS	DESCRIPTION SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)	DEPTH IN FEET
0		ROAD BOX WELL CAP			0
1		BENTONITE			1
2		WELL RISER			2
3			3.0' - 3.2' 34 PPM	Brown Med-Fine SAND, moist, sl. odor WATER TABLE	3
4					4
5			4.5' - 5.0' 0.1 PPM	Brown Med-Fine SAND, wet, sl. odor	5
6		SAND PACK	5.0' - 6.3' 17.2 PPM	Brown Coarse-Fine SAND, wet, sl. odor	6
7			6.3' - 8.0' 0.1 PPM	Green Gray TILL, wet, no odor	7
8					8
9		WELL SCREEN			9
10		BOTTOM CAP		BASE OF EXPLORATION AT 10'	10
11					11
12					12
13					13
14					14
15					15
16					16
17					17
18					18
19					19
20					20
21					21
22					22
23					23
24					24
25					25
26					26

APPENDIX C

Laboratory Report Forms



LABORATORY REPORT

EPA METHOD 8020 ANALYTES + MTBE with GC/MS Confirmation

CLIENT NAME:	Groundwater of Vermont	PROJECT CODE:	V94-027
PROJECT NAME:	Killington Ski Area	REF. #:	9,003
REPORT DATE:	June 7, 1994	STATION:	MW-1
DATE SAMPLED:	May 24, 1994	TIME SAMPLED:	16:30
DATE RECEIVED:	May 24, 1994	SAMPLER:	Ron Miller
ANALYSIS DATE:	June 3, 1994	SAMPLE TYPE:	Water

PARAMETER	PQL (µg/L)	Conc. (µg/L)
Benzene	1	BPQL
Toluene	1	7
Ethylbenzene	1	BPQL
m+p-Xylene	2	BPQL
o-Xylene	1	BPQL
Chlorobenzene	1	BPQL
1,2-Dichlorobenzene	1	BPQL
1,3-Dichlorobenzene	1	BPQL
1,4-Dichlorobenzene	1	BPQL
MTBE	1	BPQL

Surrogate % Recovery: 102%

BPQL = Below Practical Quantitation Limit (PQL).



LABORATORY ANALYSIS

CLIENT NAME: Ground Water of Vermont MAV CONTROL #: 9003
ADDRESS: The Chace Mill Box C-5 DATE OF SAMPLE: 5/24/94
 Burlington, VT 05401 DATE OF REPORT: 6/13/94
SAMPLER: Ron Miller PROJECT NUMBER: V94-027
SAMPLE LOCATION: Killington VT

EXAMINATION REQUESTED:

Test - Total Petroleum Hydrocarbons, EPA 418.1

SPECIMENS:

(2) Liter glass jars containing Water samples Labeled MW-1.

FINDINGS:

	MW-1	Units	PQL
TPH	BPQL	mg / L	1

Reviewed by:

Kenneth Somerville
Head Chemist, Chemical Services

